Flextensional Microactuators for Large-Aperture Lightweight Cryogenic Deformable Mirrors, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

TRS Technologies proposes large stroke and high precision single crystal flextensional piezoelectric microactuators for cryogenic optic devices such as large aperture deformable mirrors, etc. for future NASA space telescope missions. Single crystal piezoelectrics are attractive because they exhibit 3 to 5 times the strain of conventional piezoelectric ceramics, have very low strain hysteresis, and retain excellent piezoelectric performance at cryogenic temperatures. Flextensional single crystal piezoelectric microactuators could be used to further reduce the actuator weight in the deformable mirror, while maintain the large stroke and excellent cryogenic properties. Flextensional single crystal piezoelectric microactuator (<3x3x3 mm) with stroke > 10 um will be developed and tested. The initial DM modeling considering the flextensional actuator performance and the polymer membrane face sheet will be conducted in Phase I. At the conclusion of Phase I the feasibility of flextensional single crystal piezoelectric microactuators for membrane deformable mirror will have been demonstrated for large dynamic range wavefront correction at temperature ranged from 4K to 300K. In Phase II flextensional microactuator array and the DM membrane deformable mirrors will be prototyped and characterized.

Primary U.S. Work Locations and Key Partners

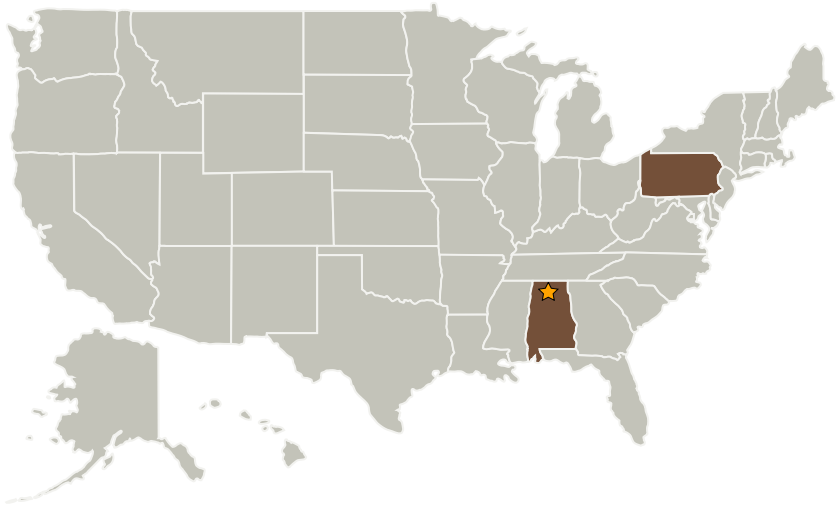

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Marshall Space Flight Center(MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
TRS Ceramics, Inc.	Supporting Organization	Industry	State College, Pennsylvania

Primary U.S. Work Locations	
Alabama	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms